

$^{12}\text{C}(^{12}\text{C}, ^{12}\text{C}), (^{12}\text{C}, \text{X})$ [2009Da22, 2016Ka37](#)

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, J. E. Purcell and C. G. Sheu		NP A968, 71 (2017)	1-Jan-2017

[2009Da22](#): $^{12}\text{C}(^{12}\text{C}, ^{12}\text{C}')$ $E=120, 139.5, 159$ MeV, analyzed elastic and inelastic $\sigma(\theta)$ using diffraction model; deduced nuclear rms radii.

[2016Ka37](#): XUNDL dataset compiled by TUNL, 2017.

The authors carried out a systematic study of the charge changing cross sections of ≈ 900 MeV/A carbon isotopes on a carbon target and analyzed the data to obtain the proton and matter radii of $^{12-19}\text{C}$.

A beam of 937 MeV/A ^{12}C ions was produced by fragmenting either a 1 GeV/A ^{20}Ne beam or 1 GeV/A ^{40}Ar beam on a thick beryllium target at the GSI/FRS facility. After magnetic separation, the ^{12}C beam particles were identified event-by-event using a multi-sampling ionization chamber and the time-of-flight between two scintillators. The beam then passed through a thick carbon target before being reanalyzed in a second multi-sampling ionization chamber that measured the Z of ions after the target. In the analysis, the ratio of the charge changing events to the non-charge changing events was determined and used to obtain σ_α , the charge changing cross section. For ^{12}C , $\sigma_\alpha=733$ mb was determined.

The data were then compared with a finite-range Glauber model to obtain root-mean-square radii for the proton distribution and for the matter distribution. The results from the systematic study across $^{12-19}\text{C}$ is then compared with various models and comments are given on the development of neutron skins and neutron halos.

 ^{12}C Levels

E(level)	J^π [†]	Comments
0	0^+	$R_{\text{r.m.s.}}^{\text{protons}}=2.32$ fm 2, $R_{\text{r.m.s.}}^{\text{matter}}=2.35$ fm 2 (2016Ka37). $R_{\text{r.m.s.}}^{\text{matter}}=2.34$ fm (2009Da22).
4.44×10^3		$R_{\text{r.m.s.}}=2.36$ fm 4 (2009Da22).
7.65×10^3		$R_{\text{r.m.s.}}=2.89$ fm 4 (2009Da22).
9.64×10^3		$R_{\text{r.m.s.}}=2.88$ fm 11 (2009Da22).
14.1×10^3		
18.5×10^3		
19.6×10^3		

[†] From Adopted Levels.